The Association of Healthful Diets and Cognitive Function: A Review

Marie Fanelli Kuczmarski, PhD, RD; Deanne Allegro, MS, RD; Emily Stave, BS

ABSTRACT

The association of diet with mild cognitive impairment has not been extensively studied. Consumption of a healthful diet may help to attenuate age-related decline in older adults. Published studies have suggested that greater adherence to a Mediterranean-style dietary pattern is associated with a lower risk of developing Alzheimer’s disease and with a slower rate of cognitive decline with age. However, published findings are inconsistent. The discrepancies most likely can be explained by the variations in both dietary and cognitive methodologies. It is not clear how diet contributes to the development of neurocognitive changes with age. This review will update available knowledge on the relationship between adherence to healthful diets and cognition, and document the need for researchers to adopt more coherent and uniform methodology to allow for better quantification of the association of diet with cognitive function. There appears to be a relationship between diet and cognition.

INTRODUCTION

The relationship between the brain and cognition is a dynamic one, changing over the lifespan. Age-related changes in brain structure and function are not uniform across the entire brain or across all individuals. Similarly, cognitive changes are not uniform across all cognitive domains or all older adults. Enormous variability exists across people, with many older individuals out-performing younger adults. The reasons explaining this variability are still under exploration by researchers studying aging.

Cognitive functions are known to decline normally as adults age. Age-related cognitive decline encompasses impairment in several domains, including executive function, memory performance, and speed of cognitive processing. In 2011, approximately 1.2 million out of 22.3 million non-institutionalized men and women aged 65 to 74 years in the United States reported a cognitive disability, defined as serious difficulty concentrating, remembering, or making decisions because of a physical, mental, or emotional condition. The prevalence was higher for African Americans compared to Whites (8.9% versus 4.9%, respectively). In addition, the prevalence of cognitive disability increased with age, with an estimated 14.5% of non-institutionalized men and women aged 75 years and older reporting a cognitive disability compared to 9.5% of those 65 years and older. Cognitive decline may not be due to chronological age per se, but rather to multiple factors representing a range of biological and physical health domains that operate along the age continuum. Factors including inadequate intakes of selected nutrients such as vitamin B12, vitamin D, choline, and monounsaturated fatty acids altered thyroid function, traumatic brain injury, subjective fatigue, and genetics have been associated with cognitive decline. Poor executive function, slower speed of processing, slower gait, and psychomotor speed are significantly associated with falls. Impaired cognition can also lead to increased risk for dementia, increasing inability to...
Cognitive
Continued from page 1

complete activities of daily living, adding to the burden of caregivers. Thus cognitive aging has substantial consequences, which can impact everyday functioning of older adults.

Over the past three decades, animal research has provided us a convincing body of evidence that dietary induced impairments in the brain can affect learning, memory, and cognition.12 A Western diet, a diet high in saturated fat and refined carbohydrates, can damage various brain systems in animals. While human research data are more limited in comparison to animal data, there is evidence of an association between diet and cognition. Research suggests that diets rich in antioxidants such as those found in fruits, especially berries and grapes, vegetables, and nuts like walnuts can enhance cognitive function with aging.13 Dietary patterns with higher intakes of fruits, vegetables, fish, nuts, and lower intakes of meat, high-fat dairy, and sweets seem to be associated with lower odds of cognitive deficits.14 However, past literature reviews describing the relationship between diet, characterized most often as adherence to the Mediterranean diet (MeDi), and cognitive health have found inconsistent and debatable findings, suggesting the need for more studies to clarify the association of diet with cognitive decline and intermediate stage of cognitive decline such as mild cognitive impairment (MCI).15–18 MCI is defined by deficits in memory that do not significantly impact daily functioning.

This review will focus only on cognitive function and will not address dementia or Alzheimer’s disease. Specifically, the review will describe tests to evaluate cognition, summarize current research findings on the association between diet and cognitive function, and offer recommendations for future research.

ASSESSING COGNITIVE FUNCTION

Early recognition of changes in cognition is important for several reasons, including diagnosis of potentially reversible medical conditions and initiation of treatment interventions. There are numerous tests used to evaluate cognitive function. Some assess executive function, an inter-related set of abilities that includes cognitive flexibility, concept formation, and self-monitoring, while others evaluate cognitive fluid abilities, which include memory, attention, and general cognitive speed, or cognitive crystallized abilities such as reading, general knowledge, and language abilities. The Folstein Mini Mental State Examination (MMSE) is often used as the standard cognitive screening instrument and marker for global cognitive function. However, there are limitations to this exam. For example, there is little room for improvement (ceiling effect) or deterioration over time (floor effect). In addition, the MMSE focuses on the “crystallized abilities” of the cognitive domains that remain relatively constant over the normal adult’s lifespan, namely, reading, general knowledge, and language abilities.19 The MMSE is also most sensitive for Whites and high school–educated persons.20 Table 1 (page 3) describes the tests used in the research studies discussed in this article.

Routine cognitive screening is not recommended for all older adults. However, when an older adult reports memory problems, family or close friends raise concerns about the individual’s memory or function, or a primary care physician notes deterioration in cognition or function, cognitive function assessment by a neurologist is recommended. Early identification of cognitive decline gives older individuals and their caregivers time to prepare for lifestyle changes, to make financial arrangements, and to plan for end-of-life care.

METHODS

A literature search of the PubMed database of the U.S. National Library of Medicine was conducted to identify cross-sectional and prospective human studies of diet and cognition in non-institutionalized adults. The following keywords were used to identify relevant studies for review: aging, cognition, cognitive function, cognitive impairment, diet, diet quality, elderly, older adults, and Mediterranean diet. The search was limited to include only studies in the English language, published in peer-reviewed journals from January 2009 through November 2013. A total of 19 studies were identified. Each article was evaluated independently by three nutritionists (two were registered dietitians) using the Evidence Analysis Worksheet of the Academy of Nutrition and Dietetics.34 Only those articles receiving a positive score (11 of the 19) were selected for inclusion in this review. The mean follow-up periods ranged from 4 to 13 years. Nine studies characterized diets using a priori methods and two used a posteriori method. Key characteristics of these studies, categorized by dietary assessment method and year of publication beginning with 2013, are provided in Table 2 (page 4).

A Priori

Findings of Martinez-Lapiscina and associates35 document the effects of a Mediterranean-style diet on cognition with participants from the PREDIMED (PREvención con Dieta MEDiterránea) study. This study is a randomized, controlled cardiovascular primary prevention trial conducted between 2005 and 2010 in Spain. There were two interventions with the MeDi: one MeDi was supplemented with 1 liter/week extra virgin olive oil (EVOO) and the other MeDi was supplemented with 30 g/day mixed nuts (walnuts, almonds, and hazelnuts), compared to a low-fat diet. Subjects were men (55 to 80 years), women (60 to 80 years), initially free of cardiovascular disease but at high vascular risk defined by having at least three major risk factors, such as hypertension, being overweight, being a current smoker, dyslipidemia, or having a family history of premature cardiovascular disease (n = 522). The MMSE and the Clock Drawing Test (CDT) were used to assess global cognition after a follow-up of 6.5 years. The mean (±SD) age at cognitive evaluation was 74.6 (±5.7) years. Results of the nutritional intervention revealed that the MeDi supple-
<table>
<thead>
<tr>
<th>Cognitive Test</th>
<th>Basic Process</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alice Heim Group Ability Test</td>
<td>This test consists of two parts: a nonverbal test of general ability where the participant must select the most appropriate image based on the instructions given, and a verbal reasoning test of general ability. The test is comprised of 65 items (32 verbal and 33 mathematical reasoning items). Participants are given 10 minutes to complete the test.</td>
<td>A recognized measure of executive function, as it integrates memory, attention, and speed of information processing</td>
<td>Estimated IQ is required for participants</td>
<td>15-point scale</td>
</tr>
<tr>
<td>Benton Visual Retention Test</td>
<td>This test is composed of three sets of 10 designs that measure the examinee’s visual perception and memory abilities. The individual is shown one design at a time, and asked to reproduce it as exactly as possible on plain paper from memory. The test is untimed, and the results are scored by form, shape, pattern, and arrangement on the paper.</td>
<td>Strong scoring system, parallel-forms reliability, and relatively short administration time</td>
<td>Modest sensitivity for executive dysfunction</td>
<td>7-point scale</td>
</tr>
<tr>
<td>Clock Drawing Test</td>
<td>Participants are asked to draw a clock face, write all the numbers on the face, and set the clock to a specific time.</td>
<td>Quick and simple way to detect executive function</td>
<td>Poor sensitivity in very mild dementia</td>
<td>12-point scale</td>
</tr>
<tr>
<td>Delis-Kaplan Trail Making Test</td>
<td>A measure of cognitive flexibility. The test consists of five subtests: visual scanning, number sequencing (the examinee is asked to link in ascending order a series of numbers from 1 to 25), letter sequencing, number-letter switching, and motor speed.</td>
<td>Validated in ethnically diverse populations, nationally normed tests with standardized scores</td>
<td>Scored by time (in seconds) needed to complete the task</td>
<td></td>
</tr>
<tr>
<td>East Boston Memory Test</td>
<td>Assesses verbal memory. Examinee is told a short story of three lines and is asked to retell the story immediately. If more than two errors are made upon recall, participants are asked to recall the story again after completing a 2-minute distracting task.</td>
<td>Orally administered with a short administration time</td>
<td>Does not measure change over time</td>
<td></td>
</tr>
<tr>
<td>Forward and Backward Digit Span</td>
<td>Measures short-term and working memory. Participants are asked to repeat two sequences of digits, forward or backward. The number of digits increases by one until the participant fails two consecutive trials of the same digit span.</td>
<td>Designed to control attention and cognitive processing; can identify very mild dementia.</td>
<td>Cut-off scores may vary from sample to sample</td>
<td>48-point scale</td>
</tr>
<tr>
<td>Free and Cued Selective Reminding Test</td>
<td>Tests for executive function. Subjects search a card containing four pictures of items (e.g., grapes, toaster) that go with unique category cues (e.g., fruit, kitchen appliances). After all four items are identified, immediate cued recall of just those four items is tested. After controlled learning has been completed for all 16 items, there are three test trials consisting of free recall, followed by cued recall for those items not retrieved using free recall. The sum of free and cued recall on each trial is the total recall.</td>
<td>Used as the standard cognitive screening instrument in the elderly population and cognition</td>
<td>Takes approximately 25 minutes to administer</td>
<td></td>
</tr>
<tr>
<td>Isaacs Set Test</td>
<td>Assesses verbal fluency by measuring the ability to generate lists of words in four semantic categories (colors, animals, fruits, and cities) in a 15 second interval.</td>
<td>Simple and easy to administer</td>
<td>Limitations for follow-up studies due to learned testing, ceiling and floor effects</td>
<td>40-point scale</td>
</tr>
<tr>
<td>Mill Hill Vocabulary Test</td>
<td>Measures crystallized knowledge, knowledge of verbal meaning, and the ability to recognize and comprehend words. It is offered in a variety of versions based off the original, including a multiple-choice format.</td>
<td>Used as the standard cognitive screening instrument in the elderly population and cognition</td>
<td>TAKES approximately 25 minutes to administer</td>
<td></td>
</tr>
<tr>
<td>Mini-Mental Status Examination</td>
<td>Measures global cognitive function.</td>
<td>Used as the standard cognitive screening instrument in the elderly population and cognition</td>
<td>Takes approximately 25 minutes to administer</td>
<td>30-point scale</td>
</tr>
<tr>
<td>Rappel Indice-48 Test</td>
<td>Measures episodic memory utilizing a task comprised of 48 items, belonging to 12 different semantic categories (four words for each of the 12 categories) where participants encode the items based on semantic cues. A cued recall test is completed after each set. At the end of all 12 sets, participants are asked to count backward for 20 seconds before completing a final cued recall task.</td>
<td>Designed to limit ceiling effects</td>
<td>Takes approximately 25 minutes to administer</td>
<td>48-point scale</td>
</tr>
<tr>
<td>Six-Item Screener</td>
<td>Comprised of six items from the Mini-Mental State Examination.</td>
<td>Can be conducted by telephone, brevity, and results comparable to MMSE</td>
<td>Mild levels of dementia cannot be determined by this screen alone</td>
<td></td>
</tr>
<tr>
<td>Stroop Colour and Word Test</td>
<td>This test assesses cognitive processing and consists of a page with color words printed in black ink, a page with “Xs” printed in color, and a color-word page with words from the first page printed in colors from the second page. The participant reads each sheet reading words or naming the ink colors as quickly as possible within a time limit. The test yields three scores based on the number of items completed on each of the three stimulus sheets.</td>
<td>Quick and easy to administer, with retestability</td>
<td>Sum of the number of correct responses in a 45-second period for each subject</td>
<td></td>
</tr>
<tr>
<td>Symbol Digit Modalities Test</td>
<td>Individuals are given 90 seconds to pair specific numbers with given geometric shapes, measuring working memory, attention and integration.</td>
<td>Easy to administer, free of cultural bias, and can measure change over time</td>
<td>Sum of the number of correct responses in a 45-second period for each subject</td>
<td>110-point scale</td>
</tr>
<tr>
<td>Telephone Interview of Cognitive Status</td>
<td>A telephone adaptation of the Mini-Mental State Examination used to assess global cognition.</td>
<td>Telephone or in-person interview, relatively short</td>
<td>Administered by trained interviewers</td>
<td>41-point scale</td>
</tr>
</tbody>
</table>
Cognitive
Continued from page 2

...intake. Kesse-Guyot and her researchers used 3,083 participants from the Continued on page 5

Table 2: Characteristics of Studies Evaluating the Association of Diet on Cognition, 2009–2013.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Study</th>
<th>Subjects</th>
<th>Dietary method &amp; construction</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Priori Studies Martinez-LoPiscina et al.</td>
<td>PREDIMED Randomized Intervention 6.5 y follow-up</td>
<td>n = 522 Spain</td>
<td>MeDi + EVOO, MeDi+nuts, Low-fat</td>
<td>MeDi supplemented with either EVOO or nuts was associated with improved global cognitive function compared to the low-fat diet.</td>
</tr>
<tr>
<td>Kesse-Guyot et al.</td>
<td>SU.VI.MAX 13 y follow-up</td>
<td>n = 3,083 French</td>
<td>24-hr diet records MDS MSDPS</td>
<td>No beneficial effect of adherence to the MeDi was found on global cognitive function (mean of six neuropsychological tests).</td>
</tr>
<tr>
<td>Tsivagoalis et al.</td>
<td>REGARDS 4 y follow-up</td>
<td>n = 17,478 U.S. Oversampling of Blacks</td>
<td>FFQ (98-item) MDS</td>
<td>Greater adherence to MeDi was associated with lower likelihood of incident cognitive impairment (modified six-item MMSE).</td>
</tr>
<tr>
<td>Samieri et al.</td>
<td>Nurses’ Health Study</td>
<td>n = 16,058 U.S. Mostly White Females</td>
<td>FFQ [116-item] A-MeDi</td>
<td>Greater adherence to A-MeDi was linearly related to better performance on a global cognition test (TICS) and verbal memory (TICS-10, EBMT) delaying cognitive aging by approximately 1 year, but not with cognitive change after a 6-year period.</td>
</tr>
<tr>
<td>Ye et al.</td>
<td>Boston Puerto Rican Health Study Cross-sectional</td>
<td>n = 1,269 U.S. Puerto Ricans</td>
<td>FFQ MDS HB-2005</td>
<td>Participants in the highest quintile of MDS had approximately 50% lower odds of cognitive impairment.</td>
</tr>
<tr>
<td>Tangney et al.</td>
<td>Chicago Health and Aging Project 7.6 y follow-up</td>
<td>n = 3,790 U.S. Blacks, Whites</td>
<td>FFQ [139-item] MDS-P HB-2005</td>
<td>MDS appeared to reduce the rate of cognitive decline (MMSE, EBMT, Symbol digit modalities). No associations found when Healthy Eating Index-2005 was used.</td>
</tr>
<tr>
<td>Scarmeas et al.</td>
<td>WHICAP 1992 &amp; 1999 cohorts 4.5 y follow-up</td>
<td>n = 1,393 U.S. Medicare beneficiaries</td>
<td>FFQ [61-item] MDS</td>
<td>Individuals in the highest tertile of adherence to MeDi had a 28% lower risk of developing MCI, while persons in the middle tertile had a 17% lower risk for developing MCI, compared to those in the lowest tertile for MeDi adherence.</td>
</tr>
<tr>
<td>Féart et al.</td>
<td>Three-City Study 5 y follow-up</td>
<td>n = 1,400 France</td>
<td>24-hr recall FFQ (40 groups) MDS</td>
<td>Higher adherence to MeDi was associated with slower global cognitive function (MMSE) decline, but no association with other cognitive tests (Isaacs Set, Benton Visual Retention, Free and Cued Selective Reminding tests).</td>
</tr>
<tr>
<td>Vercambre et al.</td>
<td>WACS 5 y follow-up</td>
<td>n = 2,504 U.S. Females</td>
<td>FFQ [116-item] MDS MDS-P</td>
<td>No association between adherence to a MeDi and cognitive decline (evaluated by five cognitive tests) in women with 3+ risk factors for or with vascular disease.</td>
</tr>
<tr>
<td>A Posteriori Studies Kesse-Guyot et al.</td>
<td>SU.VI.MAX</td>
<td>n = 3,054 French</td>
<td>24-hr diet records PCA Healthy and traditional patterns</td>
<td>Adherence to the healthy pattern was positively associated with global cognitive performance (mean of six tests) and specifically with the performance of verbal memory. The healthy pattern was positively associated with fruit, whole grains, fresh dairy products, vegetables, breakfast cereals, tea, vegetable fats, nuts, and fish.</td>
</tr>
<tr>
<td>Akbaraly et al.</td>
<td>Whitehall II</td>
<td>n = 4,693 White Europeans</td>
<td>FFQ [127-item] PCA Whole and processed food patterns</td>
<td>Higher intakes of the whole food dietary pattern were associated with lower odds of cognitive deficit (evaluated by five tests) while higher intakes of the processed food dietary pattern were associated with higher odds of cognitive deficits.</td>
</tr>
</tbody>
</table>

Note: A-MeDi, alternate MeDi; EBMT, East Boston Memory Test; EVOO, Extra Virgin Olive Oil; FFQ, food frequency questionnaire; HEI, Healthy Eating Index; MDS, Mediterranean Diet Scores using method by Trichopoulou et al.; MSD-P, Mediterranean Diet Scores using method by Panagiotakos et al.; MeDi, Mediterranean diet; MMSE, Mini-Mental State Examination; MSDPS, Mediterranean-style dietary pattern score (MSDPS) developed by Rumaws et al.; PCA, Principal Component Analysis; PREDIMED, PREvención con Dieta MEDiterránea; REGARDS, Reasons for Geographic and Racial Differences in Stroke; SU.VI.MAX, Supplementation with Vitamin and Mineral Antioxidants; TICS, Telephone Interview of Cognitive Status; WHICAP, Washington Heights Inwood Columbia Aging Project; WACS, Women’s Antioxidant Cardiovascular Study.
consumed. These records were used to calculate the Mediterranean Diet Score (MDS) using the algorithm by Trichopoulou and colleagues and the Mediterranean-style dietary pattern score developed by Rumawas and associates. Cognitive assessment included evaluations of episodic memory (Rappel index—48 items), lexical-semantic memory (verbal and phonemic fluency), short-term and working memory (forward and backward digit spans), and mental flexibility (Delis-Kaplan trial-making test). No beneficial effect of adherence to the MeDi was found on global cognitive function in this French adult population, accounting for potential confounders. A limitation of this study is that cognition was not evaluated at baseline. Although no association of adherence to the MeDi was found for education, an association was found for occupation.

Tsivogoulis and colleagues examined a cohort (n = 17,478) from the Reasons for Geographic and Racial Differences in Stroke (REGARDS) study to determine if there was a relationship between adherence to the MeDi and likelihood of incident cognitive impairment. REGARDS is a national, longitudinal study with oversampling of Blacks and individuals from the United States Stroke Belt region. Participants were excluded if they had a history of stroke, had impaired cognitive status at baseline, or were missing dietary data. The Block 98 food frequency questionnaire (FFQ) was self-administered. Then the dietary data were used to calculate MDS, using the algorithm published by Trichopoulou and colleagues. A six-item screener was used to assess cognitive function. Incident cognitive impairment was defined as a shift from intact cognitive screening status at the initial evaluation to impaired status at the last available evaluation. The mean (±SD) follow-up period was 4 (±1.5) years with 7% of persons identified with incident cognitive impairment. The mean (±SD) age of the analytical sample was 64.4 (±9.1) years. Using tertiles to categorize MeDi adherence and adjusting for all potential confounders (demographic, environmental and vascular risk factors, depressive symptoms, and self-reported health status), the researchers concluded that greater adherence to MeDi was associated with lower likelihood of incident cognitive impairment. They documented a strong interaction of diabetes mellitus on this relationship, noting that this relationship was only seen in nondiabetic individuals. Possible explanations include reduced amyloid clearance in the brain due to peripheral hyperinsulinemia and upregulation of receptor for advanced glycation end-products ligands in diabetic patients.

Samieri and colleagues examined female registered nurses who participated in the Nurses' Health Study who were 70 years of age or older and free of stroke (n = 16,058). All women completed at least one FFQ in addition to longer dietary assessments in 1984 and/or 1986, at least one cognitive assessment, and had no missing data for energy intake and physical activity. The semi-quantitative FFQ completed in 1984, 1986, 1990, 1994, and 1998 was used to construct a long-term mean alternate MeDi (A-MeDi) score, a modified version of the original score by Trichopoulou and colleagues. Cognitive measures were obtained by telephone four times over a 6-year period (1995–2000). Cognitive measures included Global cognition: Telephone Interview of Cognitive Status (TICS), Verbal memory: TICS 10-word list and East Boston Memory Test, Category Fluency, and Digit span-backward. Samieri and associates reported that long-term A-MeDi adherence was related to cognitive status at older ages, which was represented by means of all four repeated measures of cognitive status. Greater adherence to A-MeDi was linearly related to better performance on TICS and verbal memory, delaying cognitive aging by approximately 1 year, but not with cognitive change after a 6-year period. Statistical models were adjusted for age, education, long-term physical activity and energy intake, body mass index (BMI), smoking, history of depression, multivitamin use, and vascular risk factors. Women with greater adherence to a Mediterranean-style diet had higher levels of education, lower BMI values, and were more physically active. They concluded that the association of A-MeDi adherence with overall cognitive status in older age was modest, which might reflect the higher education level of the study population and the fact that U.S. populations in general have modest adherence to the MeDi compared to European populations. These researchers also examined individual components of the A-MeDi score and found that higher long-term vegetable intake was related to less decline in global cognition and higher MUFA:SFA (monounsaturated fatty acids: saturated fatty acids) ratio was related to less decline in global cognition and verbal memory.

A study of middle-aged and older Puerto Rican adults residing in the Greater Boston area of Massachusetts was conducted by Ye and colleagues. These adults were among the participants in the Boston Puerto Rican Health Study (n = 1,269) and had a mean age of 57.3 years (SD = 7.6 years). Researchers examined the association of dietary patterns, evaluated by both the adherence to MeDi and the Healthy Eating Index (HEI)-2005, on global cognitive function and seven neuropsychological tests. Dietary intake was assessed with a semi-quantitative FFQ during a home interview. The MeDi score was calculated using the procedure described by Trichopoulou and associates. The HEI-2005 score was calculated using the energy density approach following the procedures published by the U.S. Department of Agriculture (USDA) Center for Nutrition Policy and Pro-
Cognitive
Continued from page 5

motion. The MMSE was used to assess global cognitive function. The other neuropsychological tests included letter fluency, figure copying forward and backward digit span, clock drawing, short- and long-term word list recall, and the Stroop. High diet quality as determined by either adherence to the MeDi or HEI-2005 was significantly associated with cognitive function. Participants in the highest quintile of MDS had approximately 50% lower odds of cognitive impairment. Using the continuous MDS, each additional point of the MDS was associated with 13% lower odds of cognitive impairment, after adjusting for confounders. With respect to the HEI-2005 scores, participants in the highest quintile had approximately 40% lower odds of cognitive impairment and with each 10-point increase in HEI-2005 score, there was a 14% lower odds of cognitive impairment.

Data from the Chicago Health and Aging Project, an ongoing prospective study in adults ages 65 years and older (2,280 Blacks, 1,510 Whites) conducted by Tangney and colleagues, support an inverse relationship between adherence to a MeDi pattern and rate of cognitive decline. A modified version of the Harvard FFQ of 139 items was used to measure usual food intake and vitamin and mineral supplementation over the past year. The MeDi score was adapted from the method described by Panagiotakos and associates. This study began in 1993 and assessed global cognitive function at 3-year intervals based on four cognitive tests. These tests included the East Boston tests of immediate and delayed recall, the MMSE, and Symbol Digit Modalities Test. The mean (±SD) age at follow-up was 75.4 (±6.2) years. Higher energy-adjusted MeDi scores appeared to reduce the rate of cognitive decline over 7.6 years of follow-up. In addition to energy, adjustments were made for age, sex, race, education, and participation in cognitive activities. Tangney and colleagues found no associations for this population when the HEI-2005 was used.

Scarmeas and colleagues examined the association of MCI and adherence to the MeDi using data from the Washington Heights Inwood Columbia Aging Project, specifically the 1992 and 1999 cohorts. Of the 2,364 individuals initially eligible for this study, the analytical sample equalled 1,393. A 61-item version of the Willet semi-quantitative FFQ was self-administered to obtain food consumption data. Mild cognitive impairment was defined as having a subjective memory complaint and an objective impairment in at least one cognitive domain. For 82% of the participants dietary and cognitive assessments were completed at the same time. For the remainder of subjects the assessments were done within 1.5 years of each other. During the mean (±SD) of 4.5 (±2.7) year follow-up, 482 people were diagnosed with MCI. Individuals in the highest tertile of adherence to MeDi had a 28% lower risk of developing MCI, while persons in the middle tertile had a 17% lower risk for developing MCI, compared to those in the lowest tertile for MeDi adherence. Statistical models were adjusted for potential confounders including age, education, sex, ethnicity, BMI, energy, ApoE4 genotype, and time between dietary and cognitive assessments. The researchers stated that for each additional unit increase in MeDi adherence score there was an 8% less risk of developing MCI. Younger age and high education were the only other protective factors against MCI.

Féart and associates examined 1,400 adults from Bordeaux, France who participated in the Three-City study, a prospective cohort study of vascular risk factors for dementia. These participants were 65 years and older, without dementia, and with at least one follow-up re-examination over 5 years. The initial dietary evaluation was a 24-hour recall and a FFQ, administered by a diettian in the participant’s home. These data were used to calculate the MeDi score using the procedure described by Trichopoulou and colleagues. Four neuropsychological tests—MMSE, Isaacs Set test, Benton Visual Retention test, and the Free and Cued Selective Reminding test—were administered. The findings indicated that higher adherence to the MeDi was associated with slower decline on the MMSE, a marker of global cognitive function, but not other cognitive tests. This association was independent of energy intake, BMI, depression, cardiovascular risk factors, and stroke.

One study examined the association between the MeDi and cognitive decline in individuals with vascular disease or with three or more risk factors for vascular disease. Vercambre and colleagues studied female health professionals who participated in the Women’s Antioxidant Cardiovascular Study. The Willet semiquantitative FFQ of 116 items was self-administered at baseline (1995–1996). Adherence to the MeDi was calculated by two approaches: a 0- to 9-point score based on MeDi components as defined by Trichopoulou and colleagues and a 0- to 55-point score based on alcohol and ten food groups as described by Panagiotakos and associates. Approximately 3.5 years later a telephone interview of five cognitive tests (Global Cognition: TICS, Verbal memory: TICS 10-word list and East Boston Memory Test, Category Fluency measured by naming as many animals as possible in 1 minute) was administered to participants 65 years and older (n = 2,824). Three follow-up assessments were completed at 2-year intervals until 2005 (n = 2,504).

Continued on page 7
Cognitive
Continued from page 6

Controlling for a wide variety of confounders, these investigators found no association between adherence to a MeDi and cognitive decline across 5 years of follow-up. Greater adherence to the MeDi was associated with higher education, lower BMI, greater physical activity, and less smoking.

A Posteriori

Kesse-Guyot and colleagues also explored the relationship between dietary patterns at midlife and cognitive performance in French adult participants in the SU.VI.MAX study (n = 3,054). The design and cognitive tests used in this study have been described in the a priori section of this article. Dietary patterns were generated from 34 predefined food groups using principal component analysis (PCA). Two dietary patterns were reported: healthy and traditional patterns. The healthy pattern was positively associated with fruit, whole grains, fresh dairy products, vegetables, breakfast cereals, tea, vegetable fats, nuts, and fish, while the traditional pattern was positively associated with vegetables, vegetable fat, meat, and poultry. Only adherence to the healthy pattern was positively associated with global cognitive performance and specifically with the performance of verbal memory. The authors noted that the participants were more compliant and health conscious participants compared to the entire SU.VI.MAX cohort.

Akbaraly and colleagues used factor analysis to generate dietary patterns of participants in the Whitehall II study, a prospective study. Their target population was White Europeans, aged 35 to 55 years, who were measured in 1985 during the first phase and had complete data on dietary assessments, cognitive function, and covariates at the phase 7 medical examination which occurred between 2002 and 2004 (n = 4,693). A modified version of the U.S. Nurses’ Health Study FFQ of 127 items was used to collect food consumption data. Two dietary patterns—whole food and processed food—were identified from PCA. The whole food pattern was described as high in fruits, vegetables, dried legumes, and fish while the processed food pattern reflected high intakes of sweetened desserts, chocolates, fried foods, processed meats, pies, refined grains, high-fat dairy products, margarine, and condiments.

Cognitive function was assessed by five tests which included 20-word free recall test of short-term memory, AH4-1 test, Mill Hill Vocabulary test, and the phonemic and semantic verbal fluency measures. Cognitive deficit was defined as the lowest sex-specific quintile for each test. Higher intakes of the whole food dietary pattern were associated with lower odds of cognitive deficits while higher intakes of the processed food dietary pattern were associated with higher odds of cognitive deficits. Adjustments were made for demographic (sex, age, and marital status), behavioral (energy intake, smoking, and physical activity), and health measures (diabetes, hypertension, coronary heart disease, dyslipidemia, mental health, and BMI). Education had a confounding role and significantly attenuated the associations.

DISCUSSION

While six of the a priori studies found beneficial effects of consuming a Mediterranean-style eating pattern, only one a priori study reviewed found beneficial effects of adherence to the HEI-2005 on cognition (Table 2, page 4). Strong evidence to support the beneficial effects of the Mediterranean-style dietary pattern on global cognition was provided from a randomized, double-blind, controlled intervention study. Consuming the MeDi enhanced adherence to a Mediterranean-style diet because cognitive decline develops over many years. The protective effect of the MeDi on cognitive change may occur early in life, thus the impact of the MeDi may be minimized in older adult populations 75 years and older. Prospective studies, like Healthy Aging in Neighborhoods of Diversity across the Life Span study, which assesses cardiovascular, cerebrovascular, cognitive function, and diet of African American and
Cognitive
Continued from page 7

White adults 30 to 64 years of age might provide us a better understanding of the relationships of diet and cognition over adulthood.50

Another reason for heterogeneous findings may be related to variability in the types and number of cognitive evaluations implemented by researchers. Some investigators examined individual scores while others used composite scores in their data analyses. Trained neuropsychologists conducted evaluations in person while other evaluations were done over the telephone.

The pathogenesis of mild cognitive impairment is impacted by vascular, inflammatory, and oxidative mechanisms. Thus mediating effects of biological mechanisms can influence the association between nutrition and cognition, necessitating the need to control for these confounders in statistical analyses. Yet vascular risk factors and/or cardiovascular history were not always used as covariates in analyses. As shown in the appendix (page 9), covariates were variable resulting in discrepancies among adjustments for confounders.

Lifestyle and socioeconomic characteristics of study populations can impact findings. Most of the studies have found that individuals with greater adherence to the MeDi have higher levels of education, lower BMI, and generally follow healthier behaviors (greater physical activity and less smoking), compared to individuals with lower adherence scores.36,49

It is also of interest that the beneficial effect of the healthy dietary pattern on cognitive performance was observed only among participants with low energy intake (median values of 2,490 kcal for men and 1,810 kcal for women).48 This result is of importance because it appears that both the quality and the quantity of the diet play a role in the association between diet and cognition.

There is an important difference, although subtle, between factors that improve cognitive performance and factors that slow age-associated or disease-associated declines in cognitive performance. Although it may be true that certain nutrients or dietary patterns might improve cognitive performance in absolute terms, it is more likely that most beneficial nutrients or dietary patterns slow or temporarily arrest usual age-associated declines in most functions. Regrettably, most of the studies in this area do not have data appropriate to distinguish non-disease-associated declines from plateaus in which cognition is preserved while consuming beneficial nutrients or healthful diets. Only longitudinal studies with repeated assessments of both diet and cognition can shed light on the extent to which, and the duration with which, certain nutrients or dietary patterns arrest cognitive decline or actually improve cognitive performance.

The preferred methods to evaluate dietary intake and cognition in prospective or cohort studies are not clearly identified in the literature. A broad assessment of diet, providing a measure of usual food intake, is desirable since many dietary exposures and disease endpoints, as well as dietary status at baseline related to cognitive function later in life, will be investigated. Multiple dietary recalls or diet histories have been used effectively in these studies. Food frequency questionnaires have also been used because they are less expensive and easier to administer to large samples. However, if the food frequency method is used, the use of multiple dietary recalls or records is recommended in subsamples of the study population to modify and calibrate the food frequency questionnaire before the start of the study. Since the diets of individuals change over time, food frequency questionnaires should undergo repeated calibrations over the length of the study based on recalls or records.51 It is recognized that observational studies of diet in relation to cognitive function may be biased if the dietary assessment method is less reliable in individuals with cognitive impairment.52

The 24-hour recall relies primarily on specific memory of all actual events in the very recent past, whereas the food frequency method requires an individual to report usual frequency of eating food during a previous defined time period, which relies on generic memory. As the time between consumption and food intake reporting increases, individuals rely more on generic memory and less on specific memory.51 Using the USDA Automated Multiple Pass Method as the 24-hour recall, a method which uses probes, five memory passes, and food models, has been documented to provide valid results on both normal and overweight individuals.52–55

In older adults, it has been suggested that diet histories may be more suitable than 24-hour recalls.54 The food frequency questionnaire may also be suitable, but attention should be given to portion size estimation, since the mean portion sizes consumed by older adults are considerably smaller than those consumed by the general population.54

Similar to dietary intake evaluation, there are no preferred methods directly identified in the literature for measuring and detecting MCI. Cullen and associates57 stated that based on established neuropsychological profiles in different dementia cases, there are six core cognitive domains that should be included in an assessment: attention/working memory, new verbal learning and recall, expressive language, visual construction, executive function, and abstract reasoning. In a review...
article, these researchers document the types of cognitive screening tools available and discuss their suitability for assessments by physicians, community screening programs, and for identifying impairment across different cognitive abilities/domains. Their findings regarding validation methods and statistics, as well as coverage of key cognitive abilities rate the Modified Mini-Mental State Examination (3MS), Cognitive Abilities Screening Instrument (CASI), and Short and Sweet Screening Instrument highest among the 39 tests reviewed. With respect to a community sample, such as those often used in longitudinal and prospective studies, the 3MS and CASI are the only two screening instruments validated which cover all six key cognitive abilities. Wild and colleagues noted that the MCI screen (MCIS) is a brief neuropsychological test derived from the protocol of the Consortium to Establish a Registry for Alzheimer’s Disease 10-word recall test, is considered accurate for differentiating normal cognitive function from MCI. This protocol consists of tests to evaluate memory, executive function, and language. In fact, the MCIS has been found to be more sensitive to early detection of cognitive impairment than either the MMSE or CDT.

CONCLUSIONS
An older person’s diet is shaped by lifelong preferences, and the associations of diet with cognition most likely reflect a lifetime of exposure both to diet and other health behaviors. There are well-established links between changes in executive function and memory with such biomarkers as grip strength, pulmonary function, vascular health, and BMI in normal aging. It is evident that cognitive functions overlap and interact in complex and interesting ways and that environment can affect these functions. More research is needed to enhance our understanding of how diet impacts brain function.

TAKE-AWAY POINTS
- There is scientific evidence to support a relationship between greater adherence to the Mediterranean-style dietary pattern and slower global cognition decline with age.
- Dietary quality and quantity conferring optimal nutritional status throughout the lifespan may assist in the preservation of cognitive abilities with age.
- More studies would be useful to determine whether the whole diet approach is effective in slowing the progress of mild cognitive impairment and ultimately delaying the onset of dementia.
- Future research must adopt more coherent and uniform methodology to allow for clarification of how diet is associated with cognition and the risk for mild cognitive impairment.

Appendix: Covariates used in studies.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sex</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Education</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Household income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Energy intake</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Number of food records</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplement use</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifestyle Behaviors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Physical activity</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol use</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Body mass index</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Waist circumference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressive symptom</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hypertension</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Menopausal state</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medication use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>ApoE genotype</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other cardiovascular disease risks</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Follow-up time between baseline &amp; cognitive testing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time between dietary and cognitive tests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline cognition</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ABOUT THE AUTHOR

Marie Fanelli Kuczmarski, PhD, RD, LDN, is a professor of nutrition at the University of Delaware. She has been a researcher and educator for over 30 years. Her expertise is nutrition and aging. Since 2004, Marie has served as a co-investigator of the Healthy Aging in Neighborhoods of Diversity across the Life Span (HANDLS) study. This NIA-funded longitudinal study investigates the influence of race and socioeconomic status on health disparities with respect to cognitive, cardiovascular, and cerebrovascular function in African American and white urban populations.

REFERENCES

Continued on page 11
Cognitive
Continued from page 10


INTRODUCTION

Older Americans face many challenges. The importance of healthy living does not diminish as we age; rather, it becomes increasingly important. While the risk of developing a chronic condition such as heart disease, atherosclerosis, diabetes, and obesity is ever present, a more immediate problem is the risk of physical injury resulting from a fall that can lead to a loss of mobility. The loss of mobility can cause other issues, such as depression, and can increase the risk of additional falls. One in three adults older than 65 years of age will experience a fall, and the risk of falling increases with each year of age.1 Falls can result in injuries, such as a fractured hip or a traumatic brain injury. In 2010, there were 258,000 hospital admissions for hip fractures among people ages 65 and older.2 While professionals and many consumers recognize the importance of maintaining bone health to prevent falls, the significance of muscle mass maintenance is often underappreciated.

To decrease fall risk, it is critical to maintain consistent exercise, adequate protein intake, and slow loss of muscle mass. Yet the CDC estimates that over half of adults do not meet the recommended physical activity guidelines.3 This shortfall is most pronounced for adults 65–74 years of age and 75-pluses years old: 66%–72% and 56%–65% are inactive, respectively.4 Epidemiological data reports that people who are physically active tend to live longer and have lower risk for heart disease, stroke, type 2 diabetes, depression, and some cancers.5 Inactivity over time causes muscle deterioration and weakening. This insidious loss of muscle mass begins at age 30, creating a 3%–8% muscle mass loss with every decade.5 This loss is referred to as sarcopenia and is prevalent in Americans: 20% of adults younger than 70 years of age are categorized as having sarcopenia, and this statistic increases to 50% for those older than 80 years of age.5 Although some degree of muscle loss is inevitable over time, older adults can prevent and combat sarcopenia to improve their functionality and quality of life by having proper nutrition and exercise habits.

Regular exercise, especially resistance training, and adequate dietary protein consumption are two important lifestyle elements that help alleviate sarcopenia, which in turn decreases the risk of falling and improves other health problems that may occur during aging. This article educates dietetics practitioners in two ways: It provides research regarding the role of exercise to support muscle health, and it addresses the older adult’s protein requirements.

RESEARCH

Exercise is important to an individual’s health, but very few Americans achieve the recommended level of daily physical activity described in Figure 1.

Exercise provides cardiovascular benefits, mental health improvement, and aids bone maintenance.6 More importantly, exercise promotes lean muscle building and maintenance, while decreasing muscle loss. Specifically, exercise serves as an important stimulus for new muscle protein synthesis (MPS) or anabolism, making it essential for the regulation of skeletal muscle mass. The term anabolic resistance refers to a proposed mechanism of aging involving decreased skeletal muscle sensitivity to anabolic stimuli (resistance exercise and protein intake) in combination with the reduced anti-catabolic (muscle breakdown) effects of insulin.7 Due to anabolic resistance, maintaining muscle mass and strength becomes increasingly challenging for the aging population. Exercise supports muscle health, reduces weakness, and decreases the risk of injury.

A meta-analysis examining 17 trials and the effects of exercise intervention on falls and fall-related injury prevention showed beneficial results.8 The 1,405 pooled participants were community-dwelling adults at least 60 years of age, with a mean age of 76.7 years. The studies were divided into four separate groups: all injurious falls, falls resulting in medical care, severe injurious falls, and falls resulting in fractures. Exercise produced favorable effects for all four groups. The exercise techniques used in the studies were variable and included gait and balance exercises along with strength/resistance and endurance training. Two of the studies used t’ai chi as the exclusive exercise mode. The locations and

Figure 1: The current exercise recommendations for older adults 65 years of age and older, as defined by the CDC.

- Two hours and thirty minutes of moderate-intensity aerobic activity (such as brisk walking) every week.
- One of the following:
  - Resistance-training activities that exercise all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms) two or more days a week, or
  - One hour and fifteen minutes of vigorous-intensity aerobic activity (such as jogging or running) every week.
- An equivalent mix of moderate and vigorous-intensity aerobic activities and resistance-training activities that exercise all major muscle groups two or more days a week.6

Continued on page 13
number of people performing exercise were also varied. However, the estimated reduction for falls speaks volumes: 37% for all injurious falls, 43% for severe injurious falls, and 61% for falls resulting in fracture.12 Another study of similar design with participants 50 years and older reviewed specific types of resistance exercises, such as leg presses, chest presses, knee extensions, and lateral pull-downs; all of which showed positive results.9 The length of the training interventions ranged from 6 to 52 weeks, with a frequency of one to three times per week. The number of sets per exercise ranged from one to six and the number of exercises per session ranged from 5 to 16. Increased strength among participants highlights the significance of resistance exercise in the aging population. Both studies stress the importance of exercise on muscle maintenance and how exercise in turn helps alleviate some of the muscle-related problems associated with aging.

Table 1 (page 14) provides an example of a week’s worth of exercise that meets exercise recommendations for an older population.

As previously discussed, skeletal muscles become less sensitive to exercise with age, but it is also important to note that muscles become less capable of utilizing dietary protein.8 For this reason the protein recommendations for the healthy older population are higher than those for the healthy adult population; recommendations from the European Society for Clinical Nutrition and Metabolism (ESPEN) expert group are 1.0–1.2g of protein per kg of body weight for healthy adults ages 65 and older, and 1.2–1.5g of protein per kg of body weight for those who have acute or chronic conditions.11 Spacing out protein consumption throughout the day is important to increase protein utilization.12 Evidence suggests consumption of 20–30g of high-quality protein (which contains all of the essential amino acids in the correct proportions for humans) during meals or snacks is recommended to stimulate MPS.5 Examples of high-quality proteins include meat, eggs, milk, fish, and soy. High-quality soy protein may be of particular interest to older adults due to its plant origin; it is lactose-free and cholesterol free. Additionally, the FDA recommends that 25g of soy protein a day as part of a diet low in saturated fat and cholesterol may reduce the risk of heart disease.13 Other plant proteins such as quinoa and beans are also options for protein sources low in saturated fat and containing no cholesterol; however, they are not considered complete proteins, because they do not provide the full complement of essential amino acids and/or are not as well digested as other high-quality protein sources. Consistent, adequate consumption of high-quality protein may therefore impart health benefits besides maintenance of physical strength and avoidance of sarcopenia.

A review of protein and exercise as preventative for sarcopenia was conducted to better examine age-related changes due to nutrition and exercise that contribute to “anabolic resistance” of skeletal muscle.8 The researchers investigated the effects of different amounts of protein on MPS rates in elderly men. Tests were done under both non-exercised (resting) conditions and after an acute bout of resistance exercise. These results demonstrated that 40g of whey protein is more effective than 20g of whey protein following resistance exercise and under resting conditions. Additionally, although not assessed in the elderly, recent findings have shown ingestion of a blend of whey, soy, and casein stimulated MPS rates equivalent to leucine content-matched isolated whey protein in young subjects.14 Soy-dairy blends have produced benefits for younger subjects, which may encourage further studies that focus on older populations.14

**CONCLUSION**

The population of Americans 65 years of age and older will double in the next 25 years to about 72 million, and by 2030 it is estimated that 20% of the American population will be older than 65 years of age.15 Since health care for adults in this age bracket is three to five times more expensive than for younger adults, health care spending is expected to increase by approximately 25%.16 Increasing exercise and improving nutrition has never been more important for the aging population in the United States. Prevention programs incorporating more exercise and dietary protein can play a major role in reducing issues associated with aging.

In 2011, the CDC reported that emergency rooms treated 2.4 million non-fatal fall injuries, citing fractures as not only the most common injury but also the most costly.16 In addition to resulting in monetary expenditures, falls can cause disability, dependence on others, lost time from work and household duties, and an overall reduced quality of life. An issue related to the risk of falling is sarcopenia, a multi-factorial, progressive loss of muscle mass. Some of the associated contributors to sarcopenia include decreased skeletal muscle sensitivity to the anabolic effects of protein, resistance exercise, and the anti-catabolic effects of insulin. The importance of regular exercise and adequate intake of high-quality protein comes into play here. Exercise can be low impact and enjoyable, such as walking or bike riding, and as simple as walking around the mall. Some clinical data suggest that exercise should include a resistance component to help initiate muscle synthesis. Resistance exercise can be easily incorporated throughout the day by breaking exercises up.
### Table 1: A sample week showing ways to fulfill the recommended time and types of exercise.

<table>
<thead>
<tr>
<th>Day</th>
<th>Sample Exercises and Stretches</th>
</tr>
</thead>
</table>
| Monday    | **Exercise:** 30-minute walk outside.  
**Stretching:** Touch toes for 30 seconds, 3 sets. | **Side stretch:** 3 sets (each side).  
- Stand with feet together and arms at sides.  
- Raise left arm and slightly lean towards the right side, feeling the stretch through the torso. |
| Tuesday   | **Exercise:** 30 minutes of balance and gait exercises: Stand on one foot; 1 minute (each side), 3 sets.  
- Place hands on waist. Place weight on one leg. Bend the other knee and extend the bent-knee leg. Repeat for the other leg.  
- Balance walk: 15 steps, 4 sets.  
- Raise arms to sides, shoulder height. Choose a spot ahead and focus on it to keep steady while walking. Walk in a straight line with one foot in front of the other. With each step, lift the back leg. Pause for 1 second before stepping forward.  
- Toe the line: 15 steps, 4 sets.  
- Place the heel of one foot so that it touches the toes of the other foot. Keep eyes fixed on one point to stay steady while walking.  
- Back leg raises: 10 raises (each leg), 2 sets.  
- Stand behind a sturdy chair for balance. Slowly lift one leg. | **Side leg raises:** 10 raises (each leg), 2 sets.  
- Stand behind a sturdy chair and slowly lift one leg out to the side. Keep back straight and toes facing forward. The standing leg should be slightly bent. Hold position for 1 second.  
**Stretching:** Hip rotation stretch: 30 seconds (each side), 3 sets.  
- Sit tall on a chair, with knees bent to 90 degrees and feet flat on the floor. Cross the left leg over the right leg so the left ankle rests on the right knee. Gently press down on the left knee to increase the stretch. |
| Wednesday | **Exercise:** 30 minutes of resistance exercise:  
**Chest press:** 8 repetitions, 3 sets.  
- Equipment: Floor mat, dumbbell weights (choice of weight).  
- Note: common household items can also be used as weights, such as books, pans, containers.  
- Lie on back with knees bent and feet on the floor and position the dumbbells next to the chest with elbows bent. Straighten arms and press up the dumbbells. Hold for 1 second and bend arms and return hands to start position.  
- **Laternal pull-down alternative:** 10 repetitions, 3 sets.  
- Equipment: Floor mat, exercise band  
- Sit with legs out straight in front and wrap the middle of the band around the bottom of feet. Hold end of the band in each hand, pull elbows back to make shoulder blades pressed together. This motion is similar to a rowing motion.  
- **Knee extension:** 8 repetitions, 3 sets.  
- Equipment: Ankle weights  
- Sit in a sturdy chair with ankle weights on. Only the balls of your feet and toes should rest on the floor. Slowly lift one leg in front of you, but do not lock the knee. Can use a rolled bath towel under thighs for support, if necessary.  
- **Leg press alternative:** 10 repetitions, 3 sets.  
- Equipment: Floor mat, exercise band  
- Sit upright on the floor mat with legs straight, secure the band around one foot. Hold the band at each end, start with leg bent at 90 degrees and push the secured foot until leg is fully extended, but not locked. Return to starting position.  
- **Stretches:** None. |
| Thursday  | **Exercise:** 30-minute walk at the mall or grocery store.  
**Stretching:**  
**Calf stretch:** 30 seconds (each side), 2 sets.  
- Stand behind a stable chair or piece of furniture, lightly touching it for balance, and then extend right foot backward, with a slight bend in the left knee. Reach the right heel toward the ground, keeping it on the ground if flexible enough. | **Upper body stretch:** 30 second, 2 sets.  
- Stand facing a wall slightly farther than arm's length from the wall, feet shoulder-width apart. Lean your body forward and put palms flat against the wall at shoulder height and shoulder-width apart. Keep back straight and slowly walk hands up the wall until arms are above the head and hold here. Slowly walk hands back down, |
| Friday    | **Exercise:** 30-minute walk outside.  
**Stretching:**  
**Chest stretch:** 30 seconds, 2 sets.  
- Sit in a sturdy chair and hold arms out to the side, parallel with the ground, with palms facing forward. Slowly move arms back, while squeezing shoulder blades together. Stop when stretch or slight discomfort is felt. | **Ankle stretch:** 30 seconds (towards and away), 3 sets.  
- Sit in a sturdy chair and stretch legs out in front. With heels on the floor, bend ankles to point toes toward the chair. Hold the position. Bend ankles to point toes away from the chair and hold. |
| Saturday  | **Exercise:** 30 minutes of resistance exercise:  
**Biceps curl:** 10 repetitions (each side), 3 sets.  
- Equipment: Dumbbell weights. Note: common household items can also be used as weights, such as books, pans, containers.  
- Can be done sitting or standing. Hold weights at sides with palms facing and slowly lift the weights so that forearms rotate and palms face in toward your shoulders, while keeping your upper arms and elbows close to your side. Keep wrists straight and dumbbells parallel to the floor. Pause for 1 second and slowly lower weights.  
- Overhead press: 8 repetitions (each side), 3 sets.  
- Equipment: Dumbbell weights. Note: common household items can also be used as weights, such as books, pans, containers.  
- Can be done sitting or standing.  
- With a dumbbell in each hand, raise your hands with palms facing forward, until the dumbbells are level with shoulders and parallel to the floor. Slowly push the dumbbells up over head until arms are fully extended, without locking elbows. Pause for 1 second and slowly lower dumbbells to sides.  
- Side arm raises: 10 repetitions (each side), 3 sets.  
- Equipment: Dumbbell weights. Note: common household items can also be used as weights, such as books, pans, containers.  
- Can be done standing or sitting in a sturdy, armless chair. Keep feet flat on the floor even, shoulder-width apart. Keep back straight and hold the position for 1 second. Slowly raise both arms to the side, shoulder height and hold the position for 1 second. Slowly lower arms to the sides.  
- Toe stands: 8 repetitions, 4 sets.  
- Stand behind a sturdy chair, to hold for balance, with feet shoulder-width apart. Slowly stand on tip toes, as high as possible and hold position for 1 second. Slowly lower heels to the floor. | **Neck stretch:** 30 seconds, 3 sets (each side).  
- Bend your head forward and slightly to the right.  
- With the right hand, gently pull your head downward. Should feel a nice, easy stretch along the back left side of the neck. |
| Sunday    | **Exercise:** 30-minute walk around mall or grocery store.  
**Stretching:**  
**Shoulder stretch:** 30 seconds, 3 sets (each side).  
- Bring the right arm across body and hold it with the left, above or below the elbow. |  |
and using heavier household items if weights or a gym are not accessible. There are also exercise programs available for older adults, such as Silver Sneakers Fitness® program, which is offered through Medicare. (For more information about this fitness program, see the article “Physical Activity for Older Adults: The Silver Sneakers® Fitness Program,” published in the winter 2014 issue of The Spectrum, page 16.) In addition to regular strength-building exercise, protein is also an essential component in muscle maintenance. Since aging muscles may not use protein as efficiently, protein intake needs increase with age. Selection and consumption of high-quality proteins should be priorities for people as they age. Lean proteins such as fish, chicken breast, and soy are good alternatives to protein sources higher in fat and cholesterol. Utilizing current research is essential for supporting aging individuals as they either start or continue a healthy diet and an exercise regimen supportive of healthy muscles.

Conflicts of interest: The authors of this article have no conflicts of interest to declare.

### Table 2: Various ways to enhance the protein content of traditional meals and snacks. The additional protein is shown in bold.

<table>
<thead>
<tr>
<th>Traditional</th>
<th>Protein-Packed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast:</td>
<td>Breakfast:</td>
</tr>
<tr>
<td>½ c oatmeal, dry, to which water is added</td>
<td>½ c oatmeal, to which ¼ c soy milk or low-fat milk is added</td>
</tr>
<tr>
<td>2 Tbsp brown sugar</td>
<td>1 Tbsp brown sugar</td>
</tr>
<tr>
<td>1 banana</td>
<td>1 banana</td>
</tr>
<tr>
<td>½ c orange juice</td>
<td>½ c orange juice</td>
</tr>
<tr>
<td>1 c coffee</td>
<td>1 c coffee</td>
</tr>
<tr>
<td>1 Tbsp cream</td>
<td>1 Tbsp cream</td>
</tr>
<tr>
<td>Morning snack:</td>
<td>Morning snack:</td>
</tr>
<tr>
<td>½ c pretzels</td>
<td>¼ c pretzels</td>
</tr>
<tr>
<td>1 part-skim mozzarella cheese stick</td>
<td>1 part-skim mozzarella cheese stick</td>
</tr>
<tr>
<td>Lunch:</td>
<td>Lunch:</td>
</tr>
<tr>
<td>2 slices whole-wheat bread</td>
<td>2 slices whole-wheat bread</td>
</tr>
<tr>
<td>1 slice American cheese</td>
<td>1 slice cheddar cheese</td>
</tr>
<tr>
<td>2 slices turkey lunch meat</td>
<td>2 slices turkey lunch meat</td>
</tr>
<tr>
<td>2 slices tomato</td>
<td>2 slices tomato</td>
</tr>
<tr>
<td>1 medium apple</td>
<td>1 medium apple</td>
</tr>
<tr>
<td>1 c skim milk</td>
<td>1 Tbsp nut butter</td>
</tr>
<tr>
<td>2 oatmeal-raisin cookies</td>
<td>2 oatmeal-raisin cookies</td>
</tr>
<tr>
<td>Evening snack:</td>
<td>Evening snack:</td>
</tr>
<tr>
<td>1 c carrot sticks</td>
<td>1 c carrot sticks</td>
</tr>
<tr>
<td>2 Tbsp ranch dressing</td>
<td>2 Tbsp non-fat Greek yogurt dip</td>
</tr>
<tr>
<td>Dinner:</td>
<td>Dinner:</td>
</tr>
<tr>
<td>4 oz lean beef patty</td>
<td>4 oz lean beef patty</td>
</tr>
<tr>
<td>½ c romaine lettuce</td>
<td>½ c romaine lettuce</td>
</tr>
<tr>
<td>1 hamburger bun</td>
<td>1 whole-wheat hamburger bun</td>
</tr>
<tr>
<td>1 c green beans (frozen)</td>
<td>1 c green beans</td>
</tr>
<tr>
<td>Nighttime snack:</td>
<td>Nighttime snack:</td>
</tr>
<tr>
<td>1 c low-fat ice cream</td>
<td>½ c low-fat ice cream</td>
</tr>
<tr>
<td>¼ c high-fiber cereal</td>
<td>¼ c high-fiber cereal</td>
</tr>
<tr>
<td>1,850 calories, 286g CHO, 53g fat, 28g fiber, 86g protein.</td>
<td>1,850 calories, 253g CHO, 56g fat, 32g fiber, 98g protein.</td>
</tr>
</tbody>
</table>


ABOUT THE AUTHORS

Alyssa Tindall, BS, RDN, earned her bachelor of science from The Pennsylvania State University. Alyssa served as a peer educator during her time as an undergraduate and was also involved with research through The Metabolic Diet Study Center and General Clinical Research Center at PSU. After completing her dietetic internship, Alyssa worked as a nutrition research and development specialist at GNC’s corporate headquarters, in the product innovation department. She currently resides in State College, PA, where she is working toward a PhD in nutritional sciences.

Mark Cope, PhD, is a research scientist in the clinical nutrition science group at DuPont Nutrition and Health. He has worked in nutrition research for more than 15 years. Dr. Cope was awarded a National Cancer Institute Training Fellowship Award during his graduate work at the University of Alabama at Birmingham, where he received his PhD in Nutrition Sciences. As a post-doctoral scholar, he received a Ruth L. Kirschstein National Research Service Award (NRSA). Dr. Cope has been a member of American Society for Nutrition for the past five years and is currently the chairperson of the Obesity Research Interest Section. He is a seven-year member of the Obesity Society and was a member of the American Chemical Society for ten years. Dr. Cope has published several peer-reviewed papers and book chapters related to nutrition and obesity (body composition).

THE FIRST FIFTY

The First Fifty: A Pictorial History of the Academy of Nutrition and Dietetics, 1917–1967 represents the first time that the Academy’s flame has been documented in photographs. This book documents six eras in the Academy’s history—from the early years to the 1960s—in black-and-white and color photographs that wordlessly deliver a profound narrative of the origins of the Academy of Nutrition and Dietetics and the profession it represents.

Visit www.eatrightSTORE.org to purchase today!
Unsung Heroes: Supporting Our Careers in the Workplace and at Home

Naveen Khan

Editor’s note: Dietetics practitioners understand the concepts of balance and synergy. The biochemistry we study has its counterparts in our daily lives. If we don’t eat enough tyrosine, our bodies derive it from phenylalanine—re-establishing balance in the same way we as people strive to balance our daily tasks. As with people, B vitamins have their specific roles to play, but when taken as a complex, their benefits are greatly amplified.

Some of us dietetics practitioners are fortunate enough to have talented and reliable supporters in our personal, professional, and (often) combined lives. Sometimes, because of health issues or ever-mounting responsibilities, we are unable to meet all the demands our profession places upon us. Enter our personal heroes, those people upon whose shoulders we lift ourselves to accomplish higher achievements.

Heroes stay home with our children so we can earn our degrees. They travel with us to conferences and support us in many ways. They balance us. We are better practitioners and people because of them.

Yet their work is often unseen or under-acknowledged.

We interviewed four RDNs who wanted to thank their unsung heroes. Here are their stories.

He Said, “I’ll Take Care of the Kids, You Earn a Degree and Work”

Marilyn Mower, RDN, MA, ABD for PhD: Member, Healthy Aging DPG

Unsung hero: Richard Mower, BS, MEd, Certified Interior Designer

Relationship: Spouse

In the late 1960s and early 1970s, when the concept of the nuclear family was still strong, many husbands and wives enacted traditional roles at home and in the workplace. Role reversal—where the husband became the primary parent responsible for childcare and the wife had a professional career—was fairly uncommon. Yet Richard Mower told his wife, Marilyn, that he would stay home and care for their two children so she could earn a nutrition degree and then begin a professional career as a dietitian. Richard performed the morning ritual of readying their children for the day. He shuttled them to and from the daycare facility. In the evenings, Richard was the parent who fed and played with them until Marilyn returned home. The pattern held until their oldest child set off for college. Richard performed his caregiver role while continuing to teach at Montgomery College and serve as the chairman of the college’s art department.

The strategy paid off. Marilyn earned a graduate degree from NYU and started her career as a dietitian. She wrote for two consumer magazines.

“Richard taught me how to listen carefully, not to take comments personally, and how to make my writing concise and clear with terminology that is not too abstract or scientific, but relatable.”

85 Years Old and Not an RDN, but Attending FNCE® for Fun

Marilyn, who is officially retired, is still an active member of the Academy and the Healthy Aging DPG. Richard, 85 years old and also retired, became active in Marilyn’s dietetics career. Richard accompanies Marilyn to CDR test development, FNCE®, and Healthy Aging DPG meetings. He also attends the various social events associated with these organizations and is friends with a number of the other attendees. Marilyn says that his interest in these events have increased her participation and attendance. During conferences, Richard arranges for rental cars and extracurricular activities, which makes the trips more enjoyable for Marilyn.

I Am My Wife’s Best Work

Richard sees himself as a reflection of Marilyn’s work. “I am an example of what she teaches,” explains Richard. On top of having good health, Richard has learned from Marilyn how “to be patient, less critical, and more considerate when dealing with others.” Meanwhile, Richard has taught Marilyn that humor is essential in both teaching and in developing relationships with people.

How has Richard’s support influenced Marilyn’s professional career?

“I might not have been able to do as much, as well as I have, in my work because I would not have been able to work while my children were young. I would not have seen as much of the United States and learned as much about the various cultures as I have, because I might not have traveled by myself. Nor would I have traveled around the world as much as I have, and I realize how fortunate we are to live in

Continued on page 18
the United States. Life would not have been as interesting or as much fun if I had not had the support of my unsung hero.”

Traveling Companions Are “Another Set of Eyes”

Dietitian: Linda Shoaf, PhD, RDN, LDN
Unsung hero: Cynthia (Shoaf) Finley, MBA; Kathryn (Shoaf) Ayers, RPH
Relationship: Mother/Daughter

Imagine how suddenly becoming legally blind would impact your ability to work and carry out your daily tasks. Linda Shoaf was an internship director in the early 1980s when she became temporarily blinded. Over time, she regained some measure of sight in one eye. Despite her impaired eyesight, Linda continued to dedicate herself as a dietitian. With the assistance of her daughters, Cynthia and Kathryn, she has attended many professional meetings and events over the years and strengthened her professional networks. This tradition began when Cynthia accompanied Linda to a conference in San Antonio. The two had a wonderful time together, and now both of her daughters take turns traveling with Linda to dietetics-related events. Neither daughter lives close to Linda, but one always goes to her home to travel to FNCE with this dedicated dietitian. According to Cynthia, her presence at these events “adds another set of eyes,” since traveling in unfamiliar areas is difficult for Linda. Cynthia looks forward to these opportunities, because they ease the way for Linda and also allow Cynthia to spend quality time with her mother. Linda thinks her daughters “are truly selfless and set an example for all to emulate.”

By assisting their mother, explains Cynthia, Linda can put “faces and people to names from emails,” and that this “builds strength in the profession and the professionals who build these relationships.” In return, Cynthia has learned a great deal about dietetics and enjoys these adventures. Attending dietetics-related events has “broadened my exposure to areas I do not normally experience.”

We asked Linda what life would be like had her daughters not offered her this incredible support:

“I would have been unable to attend national meetings, thereby limiting my contact with so many extraordinary dietitians, especially members of Healthy Aging. I joined HA (GN) in the early 1980s and have been blessed by numerous members.”

Switching to Dietetics in Her 50s

Dietitian: Joanie Rogucki, RDN
Unsung hero: Bill Rogucki, retired software engineer
Relationship: Spouse

Before Joanie Rogucki became an RDN, she worked many years in a number of different fields. Her switch to dietetics came later in life and required her to return to school and earn her BS degree in nutritional sciences. Like many nontraditional students (students who pursue an undergraduate degree after leaving their 20s), Joanie had to balance life responsibilities beyond those of younger students: a mortgage, a spouse, and a career. As with many people who work a full-time job while taking college courses, Joanie’s progress inched forward only one course at a time. Joanie explains that she would not have been able to balance work and school without the help of her husband, Bill. Additionally, Bill made it possible for the two of them to compete in triathlons during this time (they have now been competing for 30 years). As athletes, both Joanie and Bill are interested in nutrition. A Vietnam War veteran, Bill’s later military involvement included the creation of a military dietary software application. Joanie explains that Bill’s involvement in this project, as well as his military service, has broadened her perspective about nutrition and nutritional counseling. She has learned that listening is a key piece to understanding client needs, as well as the importance of helping clients make changes one step at a time. Over the years, she has applied the teamwork and partnership skills that she and Bill have developed to her dietetics practice. Without Bill, Joanie believes she would never have entered the dietetics field and would still be working in the printing industry. Joanie and Bill currently live (and run) in Arizona—thanks to Bill’s support.

Call for Information: Conferences and Events

The Healthy Aging DPG calendar contains events of interest to RDNs and NDTRs who work with older adults. If you would like to suggest a conference or event for our calendar, please email Robin Dahm (dahmRD@gmail.com) with your information. The event must focus on the nutritional and physical health of older adults.
An Honorary Member of the Nutrition Team: Giving Beyond Her Official Job

Dietitian: Nancy McMahon, MS, RD, CSG

Unsung hero: Pam Mendoza, Director of Life Enrichment, Provisionally Certified Activity Director, Certified Dementia Practitioner

Relationship: Coworker

Thus far we have seen several unsung heroes among families. Nancy McMahon receives her support from an unsung hero who happens to be her coworker. Nancy has worked for more than 31 years as a dietitian, mostly in long-term care. Today Nancy provides nutrition support for 180 adults with a diverse range of needs—a challenge for any one person. That’s why Nancy is extremely grateful for Pam Mendoza: her coworker and right-hand supporter.

Pam is not an RDN or an NDTR. In fact, she is not a formal member of the nutrition team. Yet Pam goes beyond her responsibilities as the facility’s life-enrichment and activities director and works closely with Nancy. Pam is the kind of person who gives “without desiring anything in return,” explains Nancy. Pam involves herself in all aspects of the lives of those people in their care facility. Not only does she plan and run activities and events, but she also instigates new programs (such as a Spanish club), remodels dining rooms, organizes fundraisers, educates and provides additional support to other staff members and their families, and works to combat the onset of loneliness, boredom, and helplessness for their residents. However, Nancy would like to emphasize that Pam is not the only unsung hero at their facility. Along with the help Nancy receives from Pam, she is also helped by Auria, Karen, Luz, and Shawn. They not only do their regular jobs, but also go above and beyond to provide the best service possible to the elders. Were it not for Pam and her fellow staff members, Nancy would face the difficult task of trying to provide for nearly 200 people on her own. Because of her unsung heroes, Nancy is able to attend to the needs of many clients.

We asked Nancy how her career and experiences would be different had she not received support from Pam. Here is what she had to say: “I have never before worked with such a supportive activities/recreation/life enrichment director... who really and truly cares for the [older adults] here as well as their families and the care partners who work here. To know that Pam is in the facility helps put me at ease. I know that she will help me in any way she can to provide for our elders. She is fully supportive of all efforts to make things better for them. This certainly helps me in my job, meeting the elders’ nutritional needs.”

The stories you have just read reflect some of the amazing things people do for others. Dietitians make it their lives’ work to help others, and it is truly touching to learn the stories of the people who make it their lives’ work to help these four dietitians. Though we may not all have unsung heroes quite like these in our own careers and lives, you have likely met someone who went the extra mile to help you at least once in your professional life. Unsung heroes come in all forms, and they are not all apparent, but they are always near. Thank you to all the unsung heroes who support our dietitians; you are much appreciated.

New Name, New Benefit

In addition to expanding your professional network, you can now earn FREE CPE by participating in the new eMentoring program.

The Academy’s new name underscores the educational values our organization is committed to, and now we’re proving it.

CPE is available for both mentees and mentors!

Academy eMentoring—where experience and enthusiasm merge.

Take advantage of this benefit by visiting the Mentoring Resources page at www.eatright.org
that included the three studies in a meta-analysis published in 2013.

CI 0.61–0.92), respectively.

0.64–1.07) and 25% (HR 0.75, 95% CI 0.70, 1.10), 17% (HR 0.83, 95% CI

mortality, breast cancer–specific mor-
day vs. <4 mg/day), the risk of total
take group with the lowest (≥10 mg/
comparing the highest isoflavone in-

half were Caucasian) who were fol-

isoflavone supplements affect BMD in
women; however, this relationship has
not been observed in men. Prospective
data also show an inverse relationship
between soy intake and fracture risk
among Asian women, but most long-
pronounced for young postmeno-
cular disease through multiple mecha

Soy and Health

Cancer Society

rich sources of isoflavones.

gard is because soyfoods are uniquely
ability to reduce the risk of chronic
disease. Much of the interest in this re

trients, but in recent years they have
important for bone health, and be
provide high-quality protein, which is

Western women. Still, because they

isoflavone exposure does
tumor growth. However, clinical data
show that isoflavone exposure does
not adversely affect markers of breast
to estrogens might stimulate breast

clinical and epidemiologic
data from these three studies, which
resulted in the conclusion that isofla-

n

Cancer Epidemiology (LACE) study.

Women’s Healthy Eating and Living

(WHEL) study,

1

120

the references for the take-away points on page 19 can be found throughout the body of this article.

Our Mission
Empowering and supporting members to be food and nutrition leaders promoting life-long wellness.

Our Vision
Optimizing longevity and wellness in aging through food and nutrition.